

## ALTERNATING PHASE SHIFT MASK DESIGN WITH OPTIMIZED PHASE SHAPES

### **ABSTRACT**

A method is described for designing an alternating phase  
5 shifted mask (altPSM) by optimally selecting the width of phase  
shapes. The selection of optimal phase shape widths is achieved  
by providing a lithography metric that describes the relationship  
between phase shape width and the target image dimension such  
that the metric, such as process window or across chip linewidth  
10 variation (ACLV), is optimized. In a preferred embodiment, ACLV  
is computed by Monte Carlo simulation by providing a set of error  
distributions for lithographic parameters such as focus, dose,  
lens aberrations, and the like. Alternatively, a lookup table of  
optimal phase widths associated with target image dimensions may  
15 be provided. The resulting altPSM is characterized by phase  
shapes having widths that vary according to the widths of the  
target image dimensions.